IMPLICIT AND EXPLICIT MEASURES: A TEST OF A DISSOCIATIVE MODEL OF AGGRESSION

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Patrick D. McNiel

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IMPLICIT AND EXPLICIT MEASURES: A TEST OF A DISSOCIATIVE MODEL OF AGGRESSION

Approved by:

Dr. Lawrence R. James, Advisor
School of Psychology
Georgia Institute of Technology

Dr. Jack M. Feldman
School of Psychology
Georgia Institute of Technology

Dr. James S. Roberts
School of Psychology
Georgia Institute of Technology

Date Approved: TBD

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SUMMARY

This study tested a dissociative model of aggression measurement. Aggression is construed as having two components, each of which is associated more strongly with either implicit or explicit measures of aggression. A videogame based frustration manipulation was used to elicit hostile aggressive responses in the form of hard force applied to buttons. Instrumental aggression criteria were also assessed in the form of honesty in reporting game outcomes, willingness to pause games while believing that pausing could damage the study results, and willingness to use unfair strategies that are also described as damaging to study results. Differential prediction of these behaviors by implicit and explicit measures of aggression supported a dissociative model of aggression measurement.

CHAPTER 1

INTRODUCTION

Since the emergence of convergent validity as it is viewed through the lens of Campbell and Fisk's (1959) multitrait-multimethod matrix, a fundamental goal of test developers has been to maximize test score intercorrelations between separate measures of a given construct. The basic premise behind the multitrait-multimethod matrix is that a test can be considered a more valid measure of a construct if its pattern of correlations shows both convergence with other tests of the same construct and divergence with tests of different constructs that use similar methodology. By extending this logic, the idea that two uncorrelated tests cannot validly measure the same construct emerges. Markedly, the notion that test scores should be intercorrelated has traditionally extended to comparisons between implicit and explicit measures of personality (Bornstein, 1998; Mischel, 1972; Scott & Johnson, 1972). As McClelland, Koestner, and Weinberger (1989) note, this has been true despite the fact that these measures have a long and varied history of either not correlating or correlating only modestly. As estimated by Hofmann, Gawronski, Gschwender, Le, and Schmitt (2005) in a meta-analytic review of the relationships between the Implicit Association Test and explicit self-report measures, the mean population correlation between these two types of measures is .24.

The general reaction of psychologists to these low intercorrelations has been to conclude that either the implicit measures are worthless or the explicit measures have been designed improperly (Bornstein, 1998; McClelland et al., 1989). The problem with these conclusions is that they don't explain evidence showing both explicit and implicit

measures to be good predictors of behaviors that are theoretically associated with a given construct. Additionally, these conclusions don't account for the fact that behaviors associated with a given construct are often predicted differentially by implicit and explicit measures of this same construct. This can be seen in summaries and examples provided in Koestner, Weinberger, and McClelland, (1991) and Bornstein, (2002).

An explanation for these patterns of correlations between explicit and implicit measures and their criteria is offered in the dissociative model (McClelland et al., 1989; see also Bornstein, 2002, Koestner & McClelland, 1990; Koestner, Weinbergre, & McClelland, 1991). This model proposes that automatically activated and unconscious forces that influence thinking and behaviors remain outside of an individual's awareness and constitute the implicit personality. The model further proposes that the explicit personality is made up of self-attributed characteristics or patterns of behavior, which are relatively independent compared to the implicit personality, and that an individual acknowledges as being typical of their every day operations. McClelland and colleagues argue that the differences between implicit and explicit measures of the same personality construct may have less to do with psychometric artifacts and more to do with the fact that implicit and explicit measures represent different dimensions of personality. Following this logic they propose that the implicit and explicit personality have different behavioral correlates. Implicit measures are expected to predict behavior that is spontaneous and exhibited in a wide array of situations over time. Explicit measures are expected to predict behavior that is mostly goal directed in situations that are perceived by individuals as engaging highly salient motives or needs (see also Bornstein, 1998).

The propositions of this dissociative model have been supported by a number of studies, including Bornstein (1998, 2002) and Brunstein and Maier (2005).

It should be pointed out that the distinction between implicit and explicit measures is somewhat different than the traditional analogous categories called projective and self-report. While projective measures generally do measure implicit personality, they are usually based on subjective interpretations of stories, or associations. The term "implicit measure" is more inclusive and refers to any measure of a personality component that is not subject to introspection (James & Mazerolle, 2002, pp. 132-138). Similarly, the term "explicit measure" includes any measure of a personality component that one is able to report on through conscious processes.

The purpose of this study is to propose and test a dissociative model for aggression which will provide an explanation for the differential validities of and lack of intercorrelations between implicit and explicit measures of aggression. Specifically, the Conditional Reasoning Test for Aggression (CRT-A), which is an implicit measure, and two explicit measures of aggression will be used to predict aggressive outcomes during and after frustration manipulations. Aggressive outcomes matched to both implicit and explicit components of aggression will be used. To make the distinction between implicit and explicit clear, one of the explicit measures, called the Self Report Measure for Aggression (SR-A), attempts to measure exactly the same thing as the implicit measure (CRT-A), however it will do so in a direct and evident way. This measure asks people about their agreement with various assumptions that underlie the rationalization of aggression. For example, people are asked to indicate the extent of their agreement with the following statement "If someone hurts you, they deserve to be hurt in return". To

provide a familiar and psychometrically proven explicit comparator, the NEO-PI-R Anger Hostility scale (referred to from this point on as simply the NEO) will also be used.

CHAPTER 2

DISSOCIATIVE MODEL FOR AGGRESSION

The historical pattern of correlations between self report measures and implicit measures of personality continues when comparing various self-report measures of aggression to the CRT-A. The highest reported correlation of this kind to date can be found in James, McIntyre, Glesson, Bowler, and Mitchell (2004) between the CRT-A and the NEO-PI-R Angry Hostility scale at .26. This is a significant but low correlation between two measures that supposedly measure the same construct. As stated before, one possible explanation for this is that the implicit and explicit represent two separate dimensions of a construct, which would in this case be aggression. As Brunstein and Maier (2005, pp. 205-206) note, the types of behavior likely to be predicted by an implicit measure are those that are energized by spontaneous impulses to act. They also note that the types of behavior likely to be predicted by an explicit measure are those that are predicated by deliberate choice. They further elaborate that the implicit motive is "affectively tinged" and is activated by challenge. In contrast, the explicit motive is based on the self concept and regulates behavior to bring it into accord with an individual's "motivational self-view". In short, the implicit motive is hot, spontaneous, and likely to be activated consistently under a wide variety of circumstances, and the explicit motive is cold, deliberate, and reactive to situational forces that are salient to the individual.

To apply a dissociation model to the construct of aggression, it is necessary to define the characteristics of the implicit and explicit dimensions. To do this the "hostile-instrumental" aggression dichotomy (Bushman & Anderson, 2001) will be used. Hostile

aggression has been defined traditionally as being "impulsive, angry behavior that is motivated by a desire to hurt someone…" Instrumental aggression is defined as "premeditated, calculated behavior that is motivated by some other goal" (Bushman & Anderson, 2001).

If a test of the dissociative model of aggression could be made using behavioral criteria that are purely hostile or instrumental in nature, the expectation would be that implicit measures would predict affectively charged, impulsive, and/or malicious behavior. Additionally, it would be expected that explicit measures, which measure a person's characterization of themselves as aggressive, would predict calculated acts of aggression such as breaking rules to gain some benefit or acts that support ones view of themselves as being aggressive. A differential pattern in how the implicit and explicit measures relate to criteria would also be expected above and beyond the simple anticipated relationships with instrumental and hostile classes of behavior. This pattern could show differentiation in the presence or absence of correlations, or the magnitude and direction of correlations. Further, it would be expected that the implicit and explicit measures of aggression would not be correlated to a large degree (i.e. in the .5 and above range using the descriptors from Cohen (1988)). This is a fairly arbitrary rule, and in cases where the correlations are higher one can always parse the variances to see how much unique and shared variance the measures have with the criteria. If most of the variance is unique, then a case for dissociation can still be made.

The Bushman and Anderson article (2001) was created to propose a replacement for the "hostile-instrumental" aggression dichotomy with a categorization scheme that accounts for instances of aggression that contain both aspects of the dichotomy.

However, for the purposes of this study such a dichotomy is still useful. Hostile behavior without instrumental cognition motivating it can be insured to some extent by creating a situation in which engaging in the behavior will either serve no perceivable goal or be counterproductive to some extent. Likewise, instrumental behavior without emotive components can to some extent be ensured by providing opportunities to engage in behaviors that are elicited while a participant is calm and withdrawn from frustrating or emotionally trying situations.

CHAPTER 3

CONDITIONAL REASONING

The conditional reasoning method for personality measurement and the underlying theory is described in *Personality in Work Organizations* (James & Mazerolle, 2002). A brief description and a sample question follows.

Conditional reasoning utilizes the fact that conscious decisions may be driven or influenced by unconscious inputs, but rationalized through some conscious process. Logic that is assembled during the reasoning process is thus affected by any premises or assumptions from which rationalizations may flow. At some level, these assumptions are implicit and automatic. This is particularly true when one is engaging in everyday reasoning, as opposed to formal reasoning. The processes by which assumptions are used to rationalize decisions are called justification mechanisms (JMs) (James, 1998).

Conditional reasoning (CR) problems are inductive reasoning problems. The main distinction separating inductive reasoning problems from formal reasoning problems is that the logic in inductive problems can follow from unstated assumptions. This allows information to be missing from problems that would make one answer inevitable. However, one answer will most clearly and logically follow from the information that is given. These problems can also be thought of as real world problems, because in the real world one never has all of the information and so must fill in the gaps with assumptions or best guesses (James & Mazerolle, 2002).

Each CR problem is composed of three parts. These consist of the stem, the question, and the answer choices. The stem is composed of premises, and if appropriate

for the question type, a conclusion. The question will ask about the assumptions underlying the stem, the conclusion of the stem, or the answer choices and how they relate to the stem. By convention there are four answer choices, and two will be logical (correct). A logical answer choice is designed so that it is seen as more logical to someone who is influenced by a specific implicit assumption. In this way, two logical answers can be pitted against each other and the one that follows from an assumption held by a respondent should seem more logical and be chosen as the correct answer. The rest of the answer choices are typical reasoning question distracters (James & Mazerolle, 2002).

Conditional Reasoning Tests use justification mechanisms (JMs), which can be described as biases in reasoning that result from implicit assumptions being used as reasoning premises. An example JM underlying the rationalization of aggression is called the retribution bias. This bias is described in James, McIntyre, Glesson, Bowler, and Mitchell (2004) as

> [A] tendency to confer logical priority to reparation or retaliation over reconciliation [and] Reflected in implicit beliefs that aggression is warranted to restore respect or exact restitution for a perceived wrong. Bias is also indicated by whether a person would rather retaliate than forgive, be vindicated as opposed to cooperate, and obtain revenge rather than maintain a relationship. This bias underlies classic rationalizations for aggression based on wounded pride, challenged self-esteem, and disrespect. (p. 275)

An example question taken from this same article (p. 276) has the stem:

> The old saying `an eye for an eye` means that if someone hurts you, then you should hurt that person back. If you are hit, then you should hit back. If someone burns your house, then you should burn that person's house.

This stem is followed by the question "Which of the following is the biggest problem with the `eye for and eye` plan"? In the case of this question, there are two logical answer

choices. One is “It offers no way to settle a conflict in a friendly manner” and the other is “People have to wait until they are attacked before they can strike”. The first answer given is more appealing and seemingly logical to a person who does not reason with the retribution bias and the second is more appealing and seemingly logical to a person who does. The rest of the answer choices are meant to be easy distracters that respondents will not be too tempted to pick. By selecting one of two logical answer choices over several questions, respondents give indications of what JMs they possess and thus the degree to which cognitive mechanisms necessary to justify aggression are in place.

CHAPTER 4

HYPOTHESES

While the criterion for hostile aggression used in this study has been setup so that engaging in it would be counter productive or irrelevant to any conscious goal, it is difficult in a study that uses a frustration manipulation to gain a clean criterion measure of instrumental aggression. Frustration may cause instrumental criterion behaviors to be influenced by implicit motives as well as explicit motives. In addition, the JMs measured with the CRT-A signal that an individual is cognitively prepared to justify aggression while also providing a means by which instrumental aggression can be justified (James et al., 2005). Furthermore, empirical evidence has shown that the CRT-A predicts criteria that may be considered instrumental in nature. Examples of this include theft, lying, cheating, and attrition (James, et al., 2005).

Based on the above argument, previous research, and the expectations derived from a dissociation model of aggression, I make the following hypotheses.

H_1: The linear relationship between the CRT-A and the SR-A will not be greater than r = .3

H_2: The linear relationship between the CRT-A and the NEO will not be greater than r = .3

H_3: The CRT-A will correlate significantly with criterion measures of both hostile and instrumental aggression.

H_4: the CRT-A will, due to its implicit nature, have significantly different relationships with all aggression criteria than either the SR-A or NEO.

Because the criterion measures for hostile aggression are not based on a choice or a calculative process, it is predicted that:

H_5: The SR-A will not be correlated with the criterion measure representing hostile aggression.

H_6: The NEO will not be correlated with the criterion measure representing hostile aggression.

However the SR-A and NEO are predicted to correlate significantly with the criterion measures for instrumental aggression, thus:

H_7: The SR-A will be correlated with the criterion measures representing instrumental aggression.

H_8: The NEO will be correlated with the criterion measures representing instrumental aggression.

If the differential pattern of correlations described by these eight hypotheses is mirrored in the results of this study, it would suggest that the dissociation model of aggression is correct, and that the implicit and explicit measures used are gathering information about two separate aspects of a single construct.

CHAPTER 5

METHOD

Participants

Participants (n = 194) were recruited from the Georgia Institute of Technology School of Psychology participant pool. The reported age of participants ranged from 18 to 30 years (M = 20.18, SD = 1.95). A little over half of participants (54.1%) reported being male and 4.1% of participants did not report their sex. Participants reported their ethnicities in the following percentages: 57.7% white, 24.7% Asian, 6.7% black, 4.1% Hispanic, and 1.5% other. A small percentage of participants (5.2%) did not report their ethnicities. Compensation to participants was in the form of extra credit assignable to the psychology class of their choosing. Participants were also given 0 to 10 out of 1000 chances to win a single five hundred dollar prize.

Materials and Apparatus

Tetroid game. A game very similar to Tetris© was used for the purpose of engendering aggressive responses from participants. For the first five minutes of play, this game behaves just as a typical Tetris like game would. The name Tetramino One will be used to reference the tetroid game during this five minute time period. The following is a description of Tetramino One.

A tetramino is one of seven possible geometric arrangements of four squares that must be attached to each other by an entire side. These tetraminoes drop from the top of a defined rectangular space which has the relative dimensions of 10 squares wide by 18 squares high. The tetramino to be dropped is randomly chosen by the computer program.

While the tetraminoes are dropping they can be rotated 90 degrees per button press and moved from side to side by the player through the use of buttons on a game controller. A tetramino can also be dropped with a triple increase in speed by pressing a down button. Each tetramino stops when it encounters the bottom of the rectangular space or when it encounters the top of another tetramino. When a tetramino is stopped another tetramino appears at the top of the rectangular space and starts to drop. Additionally, the squares making up the shapes of the tetraminoes snap to a grid, ensuring that the sides of squares will not overlap with more than one other square side. Squares cannot be moved outside of the rectangular space, and tetramino segments continue to fall into cleared space while maintaining the same relative configuration with one another if supporting lines of squares are removed. The object of the game is to create solid lines of squares across the entire width of the rectangular space. Once these lines are created the squares making them up disappear, thus making room for new blocks that are perpetually dropping. The more lines one clears simultaneously, the more points awarded per line cleared. If the tetraminoes get piled high enough to reach the top of the rectangular space, then the game is over.

A segment of the tetroid game lasting 20 minutes was also used and will be referred to as Tetramino Two. This game is exactly like Tetrimino One, but with some modifications. In this segment events are assigned to each tetramino. Examples of these modification events include reversing the buttons that control the movement of a piece to the left and right, reversing the buttons that rotate a piece and drop it, and reversing the button that moves a piece down more quickly and the button that drops a piece immediately. The normal control scheme is also randomly applied as a control scheme

event. The objective of Tetramino Two is for the game segment to be extremely frustrating but not impossible. A skilled player should be able to get two or three four line eliminations within the 20 minute period. A four line elimination happens when four lines are completed at the same time by dropping a single tetramino into place, after which the game simultaneously eliminates all four completed lines.

A set of instructions were given between Tetramino One and Tetramino Two. These instructions set up several of the criterion measures of instrumental aggression and explained the goals and rewards involved with Tetramino Two. This is explained further when the instrumental aggression criteria are described. Additionally, a diagram showing the purpose of each game controller button during Tetramino One was displayed to the side of the monitor throughout the duration of the tetroid game.

Game pad and pressure sensors. A simple gamepad with fairly standard ergonomic design, a D-pad on the left, and two command buttons on the right, was used to control the tetroid game. The left, right, and down D-pad buttons were used to control the direction and drop rate of the tetraminoes, and the two command buttons were used to rotate the tetraminoes and drop them immediately.

For four of the buttons used to issue commands in the tetroid game, a FlexiForce® Sensor (Model A201) was placed between the plastic button cover and the contact sensors located just beneath the button cover. This allowed the force applied to each button during play to be continuously recorded. FlexiForce sensors are piezoresistive force sensors, meaning that they use a change in the resistance of conductive material, which is caused by compression, to measure the force of compression. As the compression increases, the resistance of the material decreases, and

the amount of force registered by the sensor increases. These sensors are capable of recording up to 100 pounds of force, have a linearity error of <+/-5%, and repeatability of <+/-2.5% of full scale (Flexiforce Sensor User Manual, 2005).

During the installation of the sensors, modifications were made to the sensitivity and feedback capacity of the D-pad buttons. The down D-pad button was made to have very little movement when pressed. The left D-pad button was made have a mushy feel and the right D-pad button was made to be both less sensitive and mushy. To be more precise, the effect of modification was to take away the crisp, responsive click and reset feel of buttons normally associated with modern game pads. Buttons without this modern feel can be extremely irritating and frustrating depending upon the task one is required to perform while using the buttons. The rotate and drop command buttons where not changed in terms of responsiveness.

Due to the incorporation of the force sensors, more than the usual one wire went from the gamepad to the computer. To hide this fact from the participants, and to protect the sensors from damage, the gamepad was fixed into position by a semi-flexible arm with a hollow center. The wires went through the arm to the appropriate ports on the computer which was hosting the software needed to both run the tetroid game and record sensor data. The computer, wires, and any devices that were not necessary to the player's experience of the game were hidden from view. This configuration is similar to those used by game console manufacturers who wish to give people a way to test their product.

Mental rotation test SLAT. A mental rotation test of variable difficulty was included as the last measurement to be taken by participants before playing the tetroid game. This test was added to lend credence to a false explanation for the experiment that

participants were exposed to. The items used were drawn from a bank that contains SLAT items that have been calibrated using IRT procedures (Embretson, 1994). This test is made up of twelve questions that ask respondents to pick the object out of four alternatives that is the same as the stem object on the left. The object on the left will represent a cube that has been unfolded to lay flat. The four objects on the right are cubes with symbols on them. One of these cubes will match the object on the left should this object be folded into a cube. The respondent must choose which object on the right is the same as the object on the left after the left object has been folded. Questions were given in a computerized format.

Measures

CRT-A. The Conditional Reasoning Test for aggression is composed of 25 inductive reasoning questions. Three of these questions are pure inductive reasoning questions placed at the beginning of the measure to enhance the face validity of the test, and 22 of these questions are inductive reasoning questions that have been designed to assess the use of JMs for aggression. The 22 scored items are each given a score of 1 if the aggressive response is chosen or a score of 0 if any other response is chosen. Each response set will be scored by summing the number of aggressive responses. However, if more than five illogical responses are chosen the response set will be considered invalidated. This method of scoring the CRT-A is recommended in James and McIntyre (2000). For this study, all CRT-A questions will be given in a computerized format.

Although the potential range of scores on the CRT-A goes from 0 to 22, very few people score higher than 12 (James & McIntyre, 2000). Even if a person has a high predisposition toward aggressive behavior, initial studies suggest that their use of JMs

does not tend to cover the entire spectrum of JM possibilities. Instead, people tend to have one or perhaps two JMs associated with aggressive behavior (Minton, 2006). This makes it highly unlikely that any one individual will choose the aggressive response on most questions in the CRT-A. Based on an analysis of score level and its relation to behavior characteristics, scores on the CRT-A are interpreted as being low from 0-2, medium from 3-7, and high for scores above 8. Scores represent individual differences in cognitive readiness to aggress (James and McIntyre, 2000).

James et al. (2005) reports internal consistency reliabilities based upon previous studies to range from .87 to .74 (alpha coefficients) for each of the five factors that make up the CRT-A. For the complete 22 item scale, the estimate of reliability was .76 using a Kuder-Richardson (Formula 20) coefficient that used the average item-total polyserial coefficient. Previous external validity estimates where also reported in this volume as ranging from .32 to .64 with a mean of .44.

More recently, the dimensionality of the CRT-A was assessed by Ko, Thompson, Shim, Roberts, and McIntyre (2008) using 4,772 participant responses across 16 separate studies. The number of dominant dimensions was ascertained by comparing the eigenvalues from a principle component analysis of real question data to the average eigenvalues generated from bootstrapped random responses to these same questions. This analysis suggested the existence of three dominant dimensions. To create scales associated with these three dimensions, a factor analysis was done in which three factors were extracted. Questions were then assigned to a dimension based on their highest factor loading. This factor analysis utilized principle axis factoring and Promax rotation. Factor names and substantive meanings were derived from both the content of questions and the

underlying assumptions (JMs) questions were designed to assess. The first factor represents a dimension called “Externalizing”. Questions that load on this factor assess ones tendency to view powerful others as victimizers and societal norms as oppressive and exploitative. Externalizers justify aggression as a necessary reaction to outside forces. The second factor represents a dimension called “Internalizing”. Questions that load on this factor assess ones tendency to view potency, dominance or retribution as being more important or desirable than cooperation, compliance, or reconciliation. Internalizers justify aggression out of a need to exert their will over others, feel powerful and respected, or to correct any perceived wrongs against them. The third factor represents a dimension called “Powerlessness”. Questions that load on this factor assess ones tendency to feel helpless, without influence, or without control. Those high on the dimension of powerlessness are thought to aggress out of frustration or an enhanced tendency to become aggravated and reactive in response to vexing forces.

Self report measures of aggression. Two self report measures of aggression were given to participants in this study. The NEO-PI-R Angry Hostility scale (NEO) is a widely known and extensively validated scale that will be used as a more standard and familiar comparator when contrasting the correlational patterns associated with the CRT-A and self report measures. The SR-A is a self report measure of aggression created to gather information about the same JMs that the CRT-A is designed to detect. Each self report scale is designed to indicate an individual’s readiness to aggress. In this respect both measures are similar in purpose to the CRT-A. However, where the CRT-A is given in a way that obfuscates its purpose; both self report measures are transparent in terms of a respondent being able to deduce what information is being sought.

The angry hostility scale from the NEO-PI-R is made up of eight items rated on a five point Likert scale that ask about a respondent's temper, threshold for anger, and feelings of anger or hostility. An example item is "I often get angry at the way people treat me". This scale represents one of six facets in the NEO-PI-R that fall under the neuroticism factor (Costa & McCrae, 1992).

The SR-A is made up of 21 items rated on a five point Likert scale that ask about the degree to which the assumptions or conclusions underlying the JMs for aggression apply to the respondent. For example, "I feel that I often get taken advantage of in life" would be a question associated with the victimization by powerful others bias, and to answer respondents would indicate a number from 1 (*strongly disagree*) to 5 (*strongly agree*) (James, McIntyre, Glisson, & Bowler, 2004).

The SR-A and NEO were integrated into a personality measure that has 31 other questions which are not related to the aggression construct. By giving participants an inventory that appears to measure a variety of personality characteristics, participants are unlikely to discern the special status of the aggression measures. This was necessary to prevent participants from behaving in an altered manner while the criterion measures were being taken because they suspect that they are being scrutinized for aggressive behavior. This strategy appears to have been effective. In a manipulation check, 20 participants were asked to tell the experimenter what they thought the 60 item self report measure was supposed to be assessing. 18 of the respondents said something similar to one of the following: "I don't know", "Lots of different things", or "It is hard to say". Two respondents indicated that they thought the questions had a lot of content having to

do with anger or hostility, but were unable to specify the reason for this. This integrated test was also administered in a computerized format.

Hostile aggression. The combination of modified button feel throughout the tetroid game and random control scheme changes during Tetramino Two give two time periods during which a person might experience frustrating obstacles. During Tetramino One, participants must create strategies for getting simultaneous four line eliminations while also dealing with buttons that are abnormal in terms of how they feel. During Tetramino Two, participants will likely have adapted to the feel of the controls, but will be faced with the new frustration of a control scheme that changes with the appearance of every new tetramino.

During the tetroid game the amount of pressure exerted on the individual force sensors was continuously recorded at a rate of 1 kHz. It takes almost zero pressure to issue a game command through the game pad buttons, and exerting more than a minimal amount of pressure creates greater demands on ones neuromuscular system to get the same degree of control over the game that can be had using light taps. Additionally, using more force than is necessary is inefficient in terms of time and can cause unintended commands to be issued. For these reasons, pressing buttons harder than is necessary is counter productive to any goal that is related to game play or its outcomes. Moreover, mashing on buttons or punching buttons hard is a very typical response to frustration with a video game. These acts are a spontaneous outlet for anger and are often accompanied by other colorful behaviors that would also indicate anger. This makes unnecessary force on game control buttons a reasonable criterion for hostile aggression. This behavior is counterproductive, impulsive, often unconscious, and indicates destructive intent.

To measure unnecessary force, the percentage of time spent above three cutoff points out of the total time spent pressing each button (containing an embedded sensor) was calculated. For each cutoff point these percentages were then summed across buttons. This was done separately for data from Tetramino One and Tetramino Two. This gives a total of six variables; three (one for each cutoff point) from Tetramino One and another three from Tetramino Two. The first cutoff point corresponds to 2 lbs of pressure on the face of a button. This point was chosen because it is above the amount of force that might be engendered by excitement or vigorous play. The second cutoff point corresponds to 5 lbs of pressure on the face of a button. This point was chosen because it represents a substantial amount of force when translated to the small area of a button face (roughly 40-50 psi where the button contacts the sensor face). Additionally, 5 lbs represents a subjective midpoint between 2 lbs and the last cutoff point of 10 lbs. At 10 lbs of force on a button face, the controller starts to feel as though it might be damaged and a great deal of counter pressure is applied to the pushing thumb. Obviously, one can expect high intercorrelations between the three cutoff points for each button, as any time spent at a higher cutoff point will also have been spent at the lower cutoff points. Three cutoff points were chosen because this type of data is new with regard to the study of aggression, and the base rates are essentially unknown. It is assumed however, that time spent above the higher cutoff points is relatively more indicative of aggression. For these reasons, the correlations between the aggression measures and the three pressure variables associated with either Tetramino One or Tetramino Two will be viewed as one piece of information. It is the existence of differential patterns of correlations that are of

interest here, and the overall set of correlations associated with the overlapping pressure variables will be more relevant in this case than individual correlations.

Performance honesty. At the end of each experiment, respondents were asked to fill out a short demographics questionnaire. The first question on this form was "In order to assign to you the appropriate number of chances to win $500.00, how many four line eliminations where you able to achieve while playing the second tetramino game for 20 minutes?" The answer to this question is scored as 0 (honest) for accurate reporting and underreporting or as 1 (dishonest) if the number of four line eliminations reported is greater than the actual amount achieved. Each reported four line elimination resulted in the participant gaining a 1 in 1000 chance at winning $500. For example, if a participant reported that he managed to get six four line eliminations during the second tetramino game, than he received a 6 in 1000 chance at winning $500. Being dishonest breaks social norms and gives a participant an unfair advantage when the winner of the $500 dollars is determined. Because of the conscious decision to lie for the purposes of obtaining some goal, lying behavior in this context is categorized as an instrumental aggression criterion.

Pausing. Before playing Tetramino Two, participants were reminded of the pause button which temporarily stops the game. They were told that the pause button is there to use in case they have to stop playing momentarily in order to wipe their hands, scratch an itch or adjust in some way. They were also asked to minimize the use of the pause feature because usage could result in unusable information from their trial and an unfair advantage over other participants. Both the amount of time spent pausing and the presence and absence of pause button use were examined. Pausing gives players an

opportunity to think and strategize that they otherwise would not have. It is a goal oriented strategy that is, as far as the participants know, harmful to the study that they have agreed to help with and possibly unfair to others. Pausing is therefore categorized as an instrumental aggression criterion.

Starting the game over. Before playing the second tetramino game, participants will be reminded that they have the ability to start the game over, however doing so too frequently can also result in unusable information from their trial and an unfair advantage. Starting a game over is a great strategy for getting more four line eliminations in a fixed period of time. As a game becomes more advanced the field tends to become more cluttered and difficult to work with. Starting a new game fixes these difficulties immediately. This is a goal oriented strategy that is, as far as the participants know, harmful to the study that they have agreed to help with and possibly unfair to others. The number of new games created is therefore categorized as an instrumental aggression criterion.

Procedure

Upon initial exposure, participants were lead to believe that the study is designed to look at various personality traits and how they interact with mental reasoning ability to affect an individual's adaptability to changing mental rotation tasks. The reason for this deception was to persuade participants to think of the questions in the SR-A and NEO as assessing one of many possible personality traits. This deception was also necessary to prevent demand characteristics and self enhancement bias from effecting the study results, and to protect the nature of the CRT-A, which was disguised as a normal inductive reasoning test.

Upon arrival to the lab, all participants experienced the following sequence of events. They were greeted in a room which is large enough to comfortably hold several people and then lead to a private computer station that was set up to give the SLAT and personality questionnaires. The CRT-A and the Self report measures were given in alternating order, and the SLAT, was given last. After completion of the SLAT the experimenter showed the participants into another room that contained the station with the tetroid game. At this point the experimenter started Tetramino One and stayed to ensure that the participant understood how the game and controls work. The experimenter also made sure participants understood what four line eliminations are and that they where practicing to get four line eliminations during Tetramino Two. When the participants finished the tetroid game the experimenter asked them to fill out a short demographics questionnaire. Once the participants completed the demographics questionnaire the experiment was over and they were given the option of a debriefing once the study is completed. A document with instructions on how to e-mail the experimenters and request a debriefing was given to each participant. After data collection was complete, a debriefing consisting of full disclosure was made available to any participant who requested it.

CHAPTER 6

RESULTS

Product moment correlations where used to determine the relationships between each respective pair of aggression measures as well as the relationships between each aggression measure and the criterion behaviors categorized as hostile aggression. Pearson correlations were also used to estimate the relationship between aggression measures and both the amount of time spent paused and the number of games played during Tetramino Two. The remaining relationships of interest in this study were assessed using biserial correlations. General relationships between all variables were assessed using product moment, biserial, polyserial, tetrachoric, or polychoric correlations as is appropriate given the scales and the underlying nature of the scales being related (Jöreskog & Sörbom, 1999). PRELIS 2.8 was used to estimate all correlations, which were calculated pairwise (Jöreskog & Sörbom, 2008).

Due to a malfunction involving the interface between the tetroid game and the pressure sensor activation command, 17 of the 194 participants were missing the data collected by these sensors. The number of missing values for other variables in the data set ranged from 3 to 11. Missing values in the latter cases were due either to nonresponse or incomplete response during one of the tasks.

The mean score on the CRT-A was 4.60 with an *SD* of 2.18. According to the CRT-A Test Manual, this indicates that on average participants in this study have a moderate degree of readiness to justify aggression and will likely waver between being aggressive and non aggressive (James & McIntyre, 2000). Additionally, Recent analyses

of the CRT-A's factor structure have shown that this instrument is best represented by three dimensions which are associated with subscales within the CRT-A (Ko, Thompson, Shim, Roberts, & McIntyre, 2008). These dimensions relate to the kinds of justifications people make for engaging in aggressive behavior and are used both in post hoc analyses and as aids to explanation. The internal consistency reliabilities for the CRT-A and its subscales were estimated using the Kuder-Richardson (Formula 20) coefficient while assuming standardized variables. The average estimate of reliability for the three subscales is .68 and the estimate of reliability for the complete 22 item scale is .69.

The mean score on the NEO was 20.80 with an *SD* of 5.16. These values indicate an increase in self perceived aggressiveness in this sample when compared to the values for the angry hostility scale ($M = 16$, $SD = 5$) that are reported in the NEO-PI-R professional manual (Costa & McCrae, 1992). The SR-A had a mean score of 60.92 with an *SD* of 8.26. The internal consistency reliabilities for both self report measures were estimated using Cronbach's Alpha. These reliability values were .79 and .76 for the NEO and SR-A respectively.

Means, standard deviations, and correlations for the three aggression measures and all initial aggression criterion variables may be seen in Table 1. The NEO and SR-A both show a relatively normal distribution, while the CRT-A and all aggression criteria are positively skewed ($p < .05$). These distributions indicate a low base rate for both JMs and the behavioral indicators of aggression used in this study. While an alpha level of .05 was used for all significance tests, some statistical test results that would only have passed at the .1 alpha level will be emphasized in order to give a clearer picture of correlational patterns.

Table 1

Scale Intercorrelations and Descriptive Statistics

		M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	CRT-A	4.60	2.18	—															
2.	NEO	20.80	5.16	.07$_{a}$	—														
3.	SR-A	60.93	8.26	.17$^{*}_{a}$	.47$^{**}_{b}$	—													
4.	CRT-A Ex	2.05	1.43	.70$^{**}_{a}$	.06$_{a}$	.14$_{a}$	—												
5.	CRT-A In	0.94	0.89	.5$^{**}_{a}$	.03$_{a}$	.06$_{a}$	.00$_{a}$	—											
6.	CRT-A Pow	1.62	1.12	.64$^{**}_{a}$	.04$_{a}$	.1$_{a}$	.09$_{a}$	.17$^{*}_{a}$	—										
7.	2 lbs T1	15.66	23.57	.15$^{*}_{c}$	-.02$_{f}$	.07$_{f}$	.10$_{c}$	.01$_{c}$	.16$^{*}_{c}$	—									
8.	5 lbs T1	2.75	9.44	.15$^{\dagger}_{c}$	.00$_{f}$	.03$_{f}$	.04$_{c}$	.00$_{c}$	.23$^{**}_{c}$	.74$^{**}_{i}$	—								
9.	10 lbs T1	0.20	1.48	.17$^{*}_{c}$	-.07$_{f}$	-.06$_{f}$	.06$_{c}$	.05$_{c}$	.21$^{**}_{c}$	.49$^{**}_{i}$	.81$^{**}_{i}$	—							
10.	2 lbs T2	24.29	26.15	.05$_{c}$	.00$_{f}$	.07$_{f}$	.04$_{c}$	-.08$_{c}$	.09$_{c}$	.69$^{**}_{i}$	.53$^{**}_{i}$	.32$^{**}_{i}$	—						
11.	5 lbs T2	3.87	6.86	-.02$_{c}$	-.04$_{f}$	-.04$_{f}$	-.06$_{c}$	-.09$_{c}$	.11$_{c}$	.63$^{**}_{i}$	.59$^{**}_{i}$	.41$^{**}_{i}$	.87$^{**}_{i}$	—					
12.	10 lbs T2	0.54	2.10	-.10$_{c}$	.05$_{f}$	.03$_{f}$	-.15$^{\dagger}_{c}$	.01$_{c}$	-.01$_{c}$	.29$^{**}_{i}$	.32$^{**}_{i}$	.28$^{**}_{i}$	.37$^{**}_{i}$	.51$^{**}_{i}$	—				
13.	Pausing	0.16	0.37	-.35$^{**}_{d}$	.25$^{**}_{g}$	.25$^{**}_{g}$	-.27$^{**}_{d}$	-.04$_{d}$	-.28$^{**}_{d}$	-.11$_{f}$	-.11$_{f}$	-.11$_{f}$	.06$_{f}$	-.01$_{f}$	.06$_{f}$	—			
14.	Pause Time	3.19	12.56	.01$_{d}$	.11$_{g}$	.19$^{**}_{g}$	-.03$_{d}$	.13$_{d}$	-.06$_{d}$	.00$_{f}$	-.03$_{f}$	-.04$_{f}$	.07$_{f}$	.00$_{f}$	-.02$_{f}$	.50$^{**}_{a}$	—		
15.	Dishonesty	0.19	0.39	-.05$_{e}$	.27$^{**}_{h}$	.16$^{*}_{h}$	-.15$_{e}$	-.08$_{e}$	.17$_{e}$	.09$_{j}$	.01$_{j}$	-.04$_{j}$	.07$_{j}$	.10$_{j}$	.09$_{j}$	.02$_{k}$	.04$_{k}$	—	
16.	Game Count	11.49	18.36	-.03$_{d}$	-.11$_{g}$	.06$_{g}$	.05$_{d}$	-.10$_{d}$	-.05$_{d}$	-.04$_{f}$	-.02$_{f}$	-.01$_{f}$	-.04$_{f}$	-.04$_{f}$	-.02$_{f}$	.26$^{**}_{a}$	.06$_{a}$	-.06$_{k}$	—

Note. 2 lbs, 5 lbs, and 10 lbs refer to the percentage of time spent above the respective cutoff points of 2, 5, and 10 pounds of pressure out of the total time spend pressing a button, summed across buttons. For Tetramino One the sum is across the three directional buttons located on the gamepad, and T1 is added to the variable name to distinguish these variables from those measured during Tetramino Two. For Tetramino Two the sum is across the three directional buttons and the rotate button and T2 is added. CRT-A Ex = the externalizing subscale in the CRT-A; CRT-A In = the internalizing subscale in the CRT-A; CRT-A Pow = the powerlessness subscale for the CRT-A; Pausing = the dichotomized pause variable; Pause Time = the amount of time spent paused in seconds; Dishonesty = Performance dishonesty; Game Count = the number of times a new game was started.
[a]n = 188. [b]n = 190. [c]n = 173. [d]n = 184. [e]n = 179. [f]n = 175. [g]n = 186. [h]n = 181. [i]n = 177. [j]n = 170. [k]n = 183.
$^{\dagger}p < .1$. $^{*}p < .05$. $^{**}p < .01$.

Among the correlations between initial criterion variables, of note are consistently strong relationships between the hostile aggression variables both within and between the two Tetramino games. Additionally, hostile aggression variables did not correlate with instrumental aggression variables. This is as expected given the reasoning behind selecting these variables, and lends support to the notion that the hostile and instrumental aggression variables chosen for this study are representative of these different and non overlapping categories of aggressive behavior. It was not expected that instrumental aggression criteria would consistently correlate with one another. The choice to engage in one instrumental form of aggression may preclude the choice to engage in another. For, example, if one chooses to lie about performance there is no need to engage in cheating behavior.

Hypotheses

Hypotheses one and two predicted minimal relationships between the self report measures of aggression and the CRT-A. Based on previously reviewed research and the expectations derived from a dissociation model for aggression, the correlations representing these relationships were not anticipated to exceed .3. Consistent with these predictions, it was found that scores on the CRT-A have a small and insignificant relationship with scores on the NEO ($r = .073$, *ns*). Also consistent with these predictions, it was found that scores on the SR-A have a significant but small relationship with scores on the CRT-A ($r = .165$, $p < .05$). Both of these implicit-explicit relationships support the idea that the two types of scales used (implicit and explicit) are measuring separate components of the aggression construct.

Hypotheses three through eight together describe the expected pattern of correlations between the aggression measures and the aggression criteria. For the sake of simplicity, the results related to hostile and instrumental aggression will be presented in turn and then related to these remaining hypotheses.

The results associated with hostile aggression were split into two separate time periods. During Tetramino One, participants were adapting to the feel of the controller, and developing strategies to get four line eliminations to be used while playing Tetramino Two. During Tetramino Two, participants were dealing with random control scheme changes, and trying to implement the strategies developed during Tetramino One. The data collected during the two time periods is analyzed separately because the meaning of the criterion measures changes from Tetramino One to Tetramino Two. During Tetramino One, the eliciting force behind aggression related to hard button presses was designed to come from the unusual feel of the buttons. By the time participants got to Tetramino Two it was expected that they would have adjusted to the controller feel. Hard button presses during Tetramino Two were expected to result from frustration with the random control scheme changes, which are bothersome all by themselves, and frustration with how easy it is to get a carefully set up four line elimination ruined by an unexpected and unpredictable control scheme change. In addition, while playing Tetramino One there is no reason to expect the rotation button to be related to any of the aggression measures. This button was not modified and retained the normal feel modern controller buttons generally have. Thus, the rotation button should not elicit aggressive hard presses, and the percentages of time for this button spent above the various force cutoff points were

excluded from the summations which created scores on the hostile aggression criteria associated with Tetramino One.

To reflect the fact that the three cutoff points at 2lbs, 5lbs, and 10lbs of pressure define nested variables, which are indicative of one piece of information, principle components analysis was performed on the three hostile aggression criteria for both Tetramino One and Tetramino Two. For both time periods only the first component has an eigen value over 1. For Tetramino One this component represents 79% of the variance in the original variables and for Tetramino Two it represents 73% of the variance. Component 1 is a representation of the general tendency to use more force than is necessary to issue commands through a game controller while playing the respective segments of the Tetroid game. Component 1 scores were generated from the two principle components analyses and are used as overall indicators of hostile aggression in further analysis. Table 2 displays results from both PC analyses.

Of the results that stem from Tetramino One the most notable outcome is that self report measures of aggression are not significantly correlated with the hostile aggression criterion. Correlations with Component 1 scores during this time are -.03 (*ns*) for the NEO and .02 (*ns*) for the SRA. In contrast, the CRT-A total scores are positively correlated with Component 1 scores ($r = .18$, $p < .05$). A stronger relationship than the one with the CRT-A total score, can also be seen when looking at the correlation between the scores on the scale representing the powerlessness sub-dimension of the CRT-A and the hostile aggression criterion ($r = .23$, $p < .01$). This would seem to indicate that the CRT-A total score/hostile aggression correlation is largely being driven by questions making up the powerlessness subscale. This was not entirely expected, but makes sense

when one considers that any frustration engendered by abnormal button feel likely corresponds to a visceral sense of control loss. To test for differences between dependant correlations, which in this case are the correlations between explicit aggression measures and the hostile aggression criterion and the correlations between the implicit aggression measure and the hostile aggression criterion, the T_2 test proposed by Williams (1959) as

Table 2

Component Loadings on the First Component from a Principle Components Analysis Performed on the Three Hostile Aggression Indicators from both Tetramino One and Tetramino Two. Eigenvalue Information from the Three Components Necessary to Account for all Variance in the Original Variables.

	Tetramino One					Tetramino Two			
		Eigenvalues					Eigenvalues		
	Component 1 Loadings	Component	Total	% Variance		Component 1 Loadings	Component	Total	% Variance
2 lbs	.832	1	2.368	78.918	2 lbs	.685	1	2.198	73.265
5 lbs	.963	2	.515	17.152	5 lbs	.908	2	.689	22.960
10 lbs	.865	3	.118	3.931	10 lbs	.951	3	.113	3.776

Note. 2 lbs, 5 lbs, and 10 lbs refer to the percentage of time spent above the respective cutoff points of 2, 5, and 10 pounds of pressure out of the total time spend pressing a button, summed across buttons. For Tetramino One the sum is across the three directional buttons located on the gamepad. For Tetramino Two the sum is across the three directional buttons and the rotate button. n = 173.

cited and recommended by Steiger (1980) was used. These tests indicate that the CRT-A is a significantly stronger predictor of the hostile aggression criterion than the NEO ($p <$ .05) and to a lesser extent the SRA ($p < .1$). Further, these tests also indicate that the Powerlessness subscale of the CRT-A is a stronger predictor of the aggression criterion than the NEO ($p < .01$) and the SRA ($p < .05$). No significant relationships between aggression measures and the hostile aggression criteria associated with Tetramino Two were found.

Performance dishonesty is one of three instrumental aggression indicators utilized in this study. Correlations between this criterion and self report measures are .27 for the NEO ($p < .01$) and .16 for the SRA ($p < .05$). No relationship between performance dishonesty and the CRT-A was found ($r = -.05$, *ns*). Tests for differences in dependant correlations indicate that the NEO is a significantly stronger predictor of performance dishonesty than the CRT-A ($p < .01$), as is the SRA ($p < .05$).

Pausing and the time spent paused are also conceived of as instrumental aggression indicators in this study. Pausing was recoded into a dichotomous variable with 1 signifying that participants used the pause button and 0 signifying that they did not. Recoding was done due to a low frequency of multiple discreet uses of the pause option. Of the 31 people who paused, only 7 did so more than once. Pause time was left as a continuous variable.

Correlations between the dichotomized pause criterion and self report measures are .24 for the NEO ($p < .01$) and .25 for the SRA ($p < .01$). The relationship between Pausing and the CRT-A is estimated at -.35 ($p < .01$). Tests for differences between dependant correlations indicate that both the NEO and SRA have relationships with the

pause criterion that are significantly different than the relationship between this criterion and the CRT-A ($p < .01$, in both cases). The relationships between the continuous pause time criterion and measures of aggression follow a similar albeit weaker pattern. The correlation between pause time and the NEO is .11 but not significant. The correlation between pause time and the SRA is .19 ($p < .01$). The relationship between Pausing and the CRT-A is essentially zero ($r = .01$, *ns*). With the amount of time spent paused as the criterion, tests for differences between dependant correlations were not significant.

The final instrumental aggression criterion was the number of times participants started a game over. None of the relationships between this criterion and measures of aggression were significant. Additionally, there were not significant differences between dependent correlations of aggression measures with the total number of games played.

Hypothesis 3 predicted that the CRT-A would significantly correlate with both hostile and instrumental aggression criteria. While this measure did predict scores on hostile aggression during Tetramino One it did not predict them during Tetramino Two. The relationship between the CRT-A and instrumental aggression was somewhat mixed. Of the four instrumental aggression criteria, only use of the pause button was related to CRT-A scores.

Hypothesis 4 predicted that the CRT-A would have significantly different relationships with the aggression criteria than self report measures of aggression. The simplest way of testing this is to use a test for differences between dependent correlations. The CRT-A, as compared to both self report measures (NEO and SR-A), was found to have significantly different relationships with hostile aggression during Tetramino One ($p < .1$ for the SR-A), the dichotomous pause variable and performance

dishonesty. Time spent paused showed an approximately zero relationship with the CRT-A and weak relationships with both self report measures, however these relationships were not strong enough to be significantly different than zero when using a test for differences between dependent correlations (for the SR-A/CRT-A comparison, $p < .1$). The number of games created was not significantly related to any aggression measure, and thus measures did not display differential relationships with this variable. During Tetramino Two, none of the aggression measures showed significant relationships with hostile aggression criteria.

Hypotheses 5 and 6 predicted a nil relationship between explicit measures of aggression and hostile aggression criteria. Results correspond with these predictions. Hypotheses 7 and 8 predicted a significant relationship between explicit measures of aggression and instrumental aggression criteria. In congruence with these predictions the NEO was positively related to pausing and performance dishonesty, and the SR-A was positively related to pausing, the amount of time spent paused, and performance dishonesty. Against expectations derived from hypotheses 7 and 8, correlations between the explicit measures of aggression and game restarts were not significant, nor was the correlation between the NEO and the amount of time spent paused.

Dissociation models predict that two indicators being contrasted will each have its own effect (or lack thereof) on various outcomes irrespective of the effects of the other. Psychometrically, this is a main effects model and implies that interactions between the two contrasted measures will not occur. If interactions do occur, then by extension one can conclude that some model other than dissociation is more appropriate for describing the relationship between the measures. As a check, analyses for

interactions between the CRT-A and both self report measures on each of the six criterion variables in this study were performed. Results showed that for all but one variable, the interaction terms in the regression equations used are non-significant. In predicting the hostile aggression criterion from Tetramino One, there was a significant interaction between the CRT-A and the SR-A. For this criterion the CRT-A/SR-A interaction term accounts for 1.7% more variance in the criterion than the measures alone ($R^2 = 0.03$). The significance of this interaction does not repeat for the CRT-A/NEO term on the hostile aggression criteria and in this sense is anomalous. This, in addition to the lack of significant interactions related to all instrumental aggression criteria, indicates that the dissociation model is an appropriate descriptor of the relationships between variables in this study.

CHAPTER 7

DISCUSSION

The primary purpose of this study was to test the idea that a dissociation model could be applied to the aggression construct. This was done by looking at differential correlates of implicit and explicit measures of aggression. Criteria were chosen that met the characteristics described by two categories of aggression, either hostile or instrumental. In addition, care was taken to ensure that criteria that belonged to one category of aggression did not also have characteristics that are described by the other category of aggression. This design was utilized to help clarify the meaning of relationships between aggression measures and various aggression criteria, and to create a strong meaningful test of measurement dissociation.

Although eight hypotheses were put forth in the introduction, the purpose of these hypotheses is to describe a pattern of relationships. In a sense, this means that one complicated hypothesis is being constructed from the individual hypotheses. That being the case, it is important for all of the hypotheses to be supported by the data in order to support the main theoretical argument presented in this paper. This argument is that implicit and explicit measures of aggression tap into distinct aspects of the aggression construct and therefore will be related to different types of aggression behaviors.

Before discussing the results as they relate to the hypotheses and the main argument of the paper, it must be mentioned that some of the criteria used in this study were previously untried. This is good in that new information on how aggression might relate to behavior was generated. However, a risk is always present when trying out new

criteria, and that risk is that the criteria won't work. Indeed, in this study two indicators that were meant to be aggression criteria simply did not relate to any of the aggression measures. The first was the count of the number of game restarts. It was thought that the count of games would be an indicator of illegal strategy use, and that this variable would be related to ones conscious view of her/himself as being willing to engage in antisocial, unfair, and yet useful behavior. It is possible that despite hints given, most people did not grasp the strategic advantage of game restarts. The variance associated with this variable may have had more to do with strategic understanding than with participant trait levels on aggression. The second indicator of aggression that did not covary with aggression measures was the hostile aggression criterion generated from Tetramino Two. The reason that this pressure sensor variable did not relate to the implicit measure of aggression is given some attention later in the discussion. For the purposes of testing a hypothesis of differential relationships, variables that do not relate to any of the measures expected to show a pattern of dissociation cannot provide insight either in support of or in contradiction to the model being tested. Because of this, hostile aggression criteria during Tetramino Two and the count of game restarts will not be considered as aggression criteria in the following discussion.

The argument that implicit and explicit measures of aggression assess separate aspects of the aggression construct, and thus may show a pattern of dissociation with behavioral correlates, is supported by the results of this study. The eight hypotheses put forth were all supported, and the expected pattern of relationships that is defined by a dissociation model was found. In congruence with hypotheses 1 and 2, the CRT-A did not relate to explicit measures of aggression to a substantial degree. In particular, the

shared variance between the CRT-A and a measure designed to assess the very same JMs that the CRT-A assesses (The SR-A) is less than three percent. This is made even more telling by the fact that the NEO and SR-A have an overlap in variance of almost 25% even though they are technically designed to assess aggression in different ways. Similarly, the relationships between the SR-A and criterion measures are congruent with those of the NEO and not the CRT-A. With the exception of the NEO/pause time correlation, both self report measures correlate significantly with all instrumental aggression criteria. This is as expected from hypotheses 7 and 8. Additionally, neither of the self report measures significantly correlate with the hostile aggression criterion. This is as expected from hypotheses 5 and 6. Hypothesis 4 proposed that the nature of relationships between the implicit measure and criteria will be fundamentally different than relationships between each of the self report measures and criteria. For instrumental aggression criteria it was found that correlations with the CRT-A were significantly different than correlations with the explicit measures of aggression. This is specifically true for relationships with pausing and performance dishonesty, but not for relationships with the amount of time spent paused. For the hostile aggression criterion, it was also found that correlations with the CRT-A were different than correlations with the explicit measures of aggression. This is specifically true when comparing the CRT-A and the NEO. However the difference in relationships involving the SR-A and CRT-A only approaches significance. Thus, hypothesis 4 is also well supported if not completely supported. Hypothesis 3 was also supported, however this hypothesis has more to do with the nature of the CRT-A than with the main argument of this paper.

The real strength of these findings comes from a lack of coherence between the CRT-A and the SR-A. Results point to the inability of explicit tests to measure implicit aspects of a construct. If the SR-A were actually measuring the JMs that the CRT-A measures, than the expectation would be congruence of relationships. If the SR-A is measuring self perceptions of JM possession, than expectations change. It has been suggested by a number of authors that one cannot always self report on implicit social constructs, and that self perceptions of implicit reasons, purposes, or motives can be quite inaccurate (Greenwald & Banaji, 1995; James & Mazerolle, 2005; Nisbett & Wilson, 1977; Winter, John, Stewart, Klohnen, & Duncan, 1998). If the SR-A is measuring self perceptions, which it must because it asks direct questions about ones view of themselves, than the lack of congruence with the CRT-A can be attributed to the inability of people to self report on JMs. Yet, at the same time the SR-A does predict aggression criteria, the same criteria that the NEO predicts. This suggests that the act of self perception produces qualitatively different information about ones aggressive tendencies than the more indirect method of Conditional Reasoning, and that a dissociation model of aggression is appropriately specified.

Post Hoc Explanations

A few of the findings generated by this study are unusual and required some exploration. While the positive correlations between self report measures and pausing were as expected, the negative correlation between the pause criterion and the CRT-A was not. Because the pause criterion is representative of instrumental aggression, it was expected that the CRT-A would either show a positive or nil relationship with it. To investigate this peculiar relationship, regression analysis was used to parse the

relationship of the CRT-A and the scales representing the sub dimensions of the CRT-A with the dichotomous pause criterion. The CRT-A accounts for 12% of the variance in pausing. The non-overlapping scales representing the externalizing, internalizing, and powerlessness sub dimensions together account for 14% of the variance in pausing. However, while the externalizing scale accounts for 7% of this variance and the powerlessness scale accounts for 8% of this variance, the internalizing scale accounts for essentially no variance at all. So, the relationship between the CRT-A and pausing is being driven entirely by two of the three scales of the CRT-A. The nature of these two scales is telling, and can help provide an explanation for the negative relationship in question.

The externalizing scale contains questions that assess ones tendency to view the world as exploitative, victimizing, and oppressive. In the context of this study, where participants are asked to do a task that is both awarding of good performance and extremely difficult or impossible, those who are higher on the externalizing dimension may see this task as purposely unfair or as an attempt to victimize them in some way. One possible response to this view would be to disengage from the task. In a similar vein, the powerlessness scale contains questions that assess ones tendency to view him or herself as lacking influence or control. For those who are higher on the powerlessness dimension, enhanced feelings of frustration, associated with a task that is specifically designed to make control difficult, may also lead to disengagement from the task. As a tentative explanation for the negative relationship between the CRT-A and pausing, task disengagement has several merits. Foremost among them is that participants who are not taking the Tetramino Two task seriously will be less likely to use the pause button as a

means of gaining an unfair advantage. Due to a sense of indifference, these same people will also be less likely to pause the game for legitimate reasons. From a theoretical standpoint, disengagement in this case may be seen as a form of passive aggression. By withholding behaviors or effort needed to maximize performance participants are obstructing the goals of the research that they agreed to be a part of.

Empirically, evidence exists in the data collected for this study that supports the idea that those higher on the externalizing and powerlessness subscales of the CRT-A, and thus the CRT-A itself, are likely to disengage from the Tetramino Two task. Item one is the lack of significant relationships between scales of the CRT-A and hostile aggression criteria associated with Tetramino Two. While it is not the only possible explanation for these reduced relationships, task disengagement and the accompanying reduction in frustration and sense of involvement would be expected to reduce hard button presses. Item two is a general negative trend in relationships between performance indicators and both the externalizing and powerlessness scales. Most of these relationships are non significant, however of note is a correlation of -.18 ($p < .05$) between the number of triple line eliminations and the externalizing subscale scores and a correlation of -.15 ($p < .05$) between the number of double line eliminations and scores on this same scale. Participants were instructed to perform maximally, therefore these negative relationships with performance indicators point to a reduction in effort, and by extension task engagement. Table 3 gives correlations between performance indicators and aggression measures.

Table 3

Aggression Measure and Performance Indicator Intercorrelations

		1	2	3	4	5	6	7	8	9	10	11
1.	SR-A	—										
2.	NEO	0.47^{**}_{b}	—									
3.	CRT-A	0.17^{*}_{a}	0.07_{a}	—								
4.	CRT-A Ex	0.14_{a}	0.06_{a}	0.70^{**}_{a}	—							
5.	CRT-A In	0.06_{a}	0.03_{a}	0.50^{**}_{a}	0.00_{a}	—						
6.	CRT-A Pow	0.09_{a}	0.04_{a}	0.64^{**}_{a}	0.09_{a}	0.17^{*}_{a}	—					
7.	Total Lines	-0.01_{g}	-0.14_{g}	-0.07_{d}	-0.12_{d}	0.07_{d}	-0.04_{d}	—				
8.	Single lines	-0.08_{g}	-0.14_{g}	-0.03_{d}	-0.07_{d}	0.09_{d}	-0.04_{d}	0.84^{**}_{a}	—			
9.	Sim double lines	0.08_{g}	-0.03_{g}	-0.11_{d}	-0.15^{*}_{d}	0.00_{d}	-0.03_{d}	0.73^{**}_{a}	0.50^{**}_{a}	—		
10.	Sim triple lines	0.03_{g}	-0.02_{g}	-0.09_{d}	-0.18^{*}_{d}	0.02_{d}	0.04_{d}	0.49^{**}_{a}	0.24^{**}_{a}	0.22^{**}_{a}	—	
11.	Sim quadruple lines	0.05_{g}	-0.11_{g}	0.00_{d}	0.03_{d}	0.03_{d}	-0.05_{d}	0.42^{**}_{a}	-0.02_{a}	0.18^{*}_{a}	0.19^{*}_{a}	—

Note. Total Lines = the total number of lines eliminated across all games played during Tetramino Two; Single lines = the total number of single line eliminations across all games played during Tetramino Two; Sim double lines = the total number of simultaneous two line eliminations across all games played during Tetramino Two; Sim Triple lines = the total number of simultaneous three line eliminations across all games played during Tetramino Two; Sim quadruple lines = the total number of simultaneous four line eliminations across all games played during Tetramino Two; CRT-A Ex = the externalizing subscale in the CRT-A; CRT-A In = the internalizing subscale in the CRT-A; CRT-A Pow = the powerlessness subscale for the CRT-A.
$^{a}n = 188$. $^{d}n = 184$. $^{g}n = 186$.
$^{*}p < .05$. $^{**}p < .01$.

*Future Directions and Limitation*s

Several limitations inherent in the current study should be mentioned. First, this study represents a single incident in which a dissociation model of aggression holds. A lab setting was used along with a contrived task to elicited aggressive responding. Given that this arrangement produced expected result, further studies using other criteria are necessary to broaden the scope of the dissociation model as it applies to the aggression construct. Specifically, studies that use natural environments and real world criteria are needed to show if clean dissociation can be found in environments and situations where aggression is likely to occur. A compilation of numerous such studies will help to reveal triggers for specific types of aggression, the appropriate use of different types of measurement systems, and generalizations about when aggression is caused by the implicit or explicit aspects of personality.

Second, the use of pressure sensors as indicators of aggression was untried. Although results were obtained, the effect sizes of these results were not large. This can be credited to any number of factors. However, within the context of this study, it is likely that static in data accrued over the 5 and 20 minute time periods had a masking effect. It is also likely that the amount of time spent playing the game had an effect on ones urge to use great amounts of pressure. This study seems to indicate that shorter time periods in which aggression is elicited work better. However, the current study had too many confounding factors to show this definitively. If this criterion is to be used in future research, it would be beneficial to find out how time effects motivation to increase pressure as an outlet for aggressive feelings.

Third, Unexpected results were obtained with regard to pausing and hostile aggression during Tetramino Two. While these results did not run counter to the hypotheses of this study they did change the authors interpretation the relationship of these two criteria with the CRT-A. Task disengagement was proposed as the reason for the unexpected results. However, this explanation is tentative and more research is required to determine definitively if and to what extent task disengagement is an aggressive response, and under what conditions this may hold true.

As it was alluded to previously, dissociation is not the only model that may appropriately describe the disjointed relationships between implicit and explicit measures of aggression. A study previously conducted by Frost, Ko, and James (2007) showed significant interactions between these measure on three distinct criteria. This study tested a channeling hypothesis that was given psychometric properties through an integrative model. This model specifies the moderation of one measures (implicit) relationship with a criterion by the other (explicit). The relative accuracy of these two models in all likelihood reflects the update in categories of aggression recommended by Bushman and Anderson (2001). These authors suggested that continuing to adhere to the strict aggression dichotomy that is embodied by the hostile-instrumental classes of aggression will hinder further understanding of aggression as a class of behavior. Instead, they argue that aggression is often the result of multiple motives, drives, and cognitive processes. To the extent that a particular behavior is resultant from several cognitions, some implicit and some explicit, the expectation would be that measures directed at the particular nature of these cognitions will be more likely to predict the behavior. If the cognitions are

purely implicit in nature, then self report measures are unlikely to give insight into them. If multiple cognitions at various levels of consciousness result in behavior, than some combination of implicit and explicit measures will likely be better investigative tools. By this logic, if cognitions interact and effect one another to determine behavior than integrative models will likely be more appropriate. If cognitions are rather singular in nature or do not interact with one another to effect behavior, than dissociation models are likely to be better fitting. These are all suppositions that require further investigation. The untangling of what classes and types of aggressive behavior may be best predicted by which model and/or measurement system, will do much to increase both our understanding of the aggression construct and the predictive utility of aggression measures.

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